CALTRANS

PROJECT MANAGEMENT

HANDBOOK

Third Edition

CALIFORNIA DEPARTMENT OF TRANSPORTATION

April 1999

Project Management is

the application of knowledge, skills, tools and techniques to project activities in order to meet (or exceed) sponsors' and external customers' needs and expectations from a project.[1]

April 1999

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CHAPTER 1 INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

This document provides generic guiding concepts for project management within Caltrans. This document supersedes the September 1997 CALTRANS Project Management Handbook, 2nd, edition, the January 1995 CALTRANS Project Management Handbook and the Project Management Terms and Definitions that were attached to the memorandum on Workplans dated May 16, 1997 signed by Joel Haven, Acting Program Manager for the Project Management Program.

1.2 WHY PROJECT MANAGEMENT?

We are living in a very competitive and rapidly changing world. Businesses and governments throughout the world are reevaluating operations in an effort to become leaner, more effective and more competitive. Caltrans must compete in this world where the efficient use of tax dollars is required due to the limited resources available compared to the transportation needs.

Project Management Vision

We deliver transportation improvements that meet customer needs.

Project Management Mission

Project teams use project management to deliver quality projects that are timely and cost-effective.

The purpose of project management is to:

- Deliver projects that satisfy customer needs.
- Improve project delivery performance related to quality, scope, schedule, and cost.
- Reduce the support cost of producing the project.
- Do the right things right the first time.
- Anticipate and respond to issues before they become problems.
- Effectively communicate with stakeholders.
- Manage change

CHAPTER 2 PROJECT MANAGEMENT CONCEPTS

2.1 THE PROJECT

Project Definition

A project is a temporary endeavor undertaken to produce a unique outcome. Caltrans undertakes several types of projects. These include Capital Projects, Programmed Projects, Federal Projects, Right of Way Only Projects and Quality Improvement Projects.

A Capital Project is a temporary endeavor undertaken to create a unique physical improvement to the transportation system in California. The word "project" refers to the work that is performed. Projects produce products.

The Project Life cycle

The Project Life Cycle defines the phases through which a project passes. A phase is marked by the completion of a highest-level deliverable in the project Work Breakdown Structure.

Caltrans' Capital Project life cycle includes the phases illustrated in Figure 2-1.

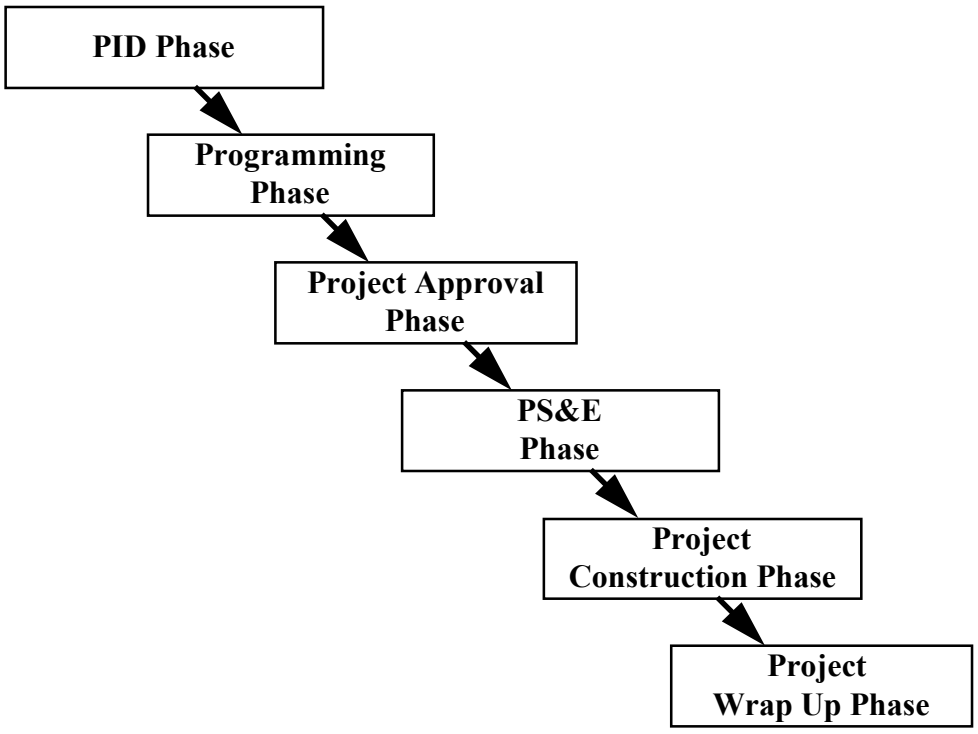

Figure 2-1 Capital Project Life Cycle

Project Initiation Document (PID) Phase

Alternative solutions to a transportation need or problem are identified. The highest-level deliverable completed during this phase is the Project Initiation Document (PID). This document contains a defined project scope, a reliable capital and support cost estimate and a project schedule suitable for programming the project.

Programming Phase

The project is placed in a program of projects (STIP, SHOPP, etc.) and funding is secured. The highest-level deliverable completed during this phase is a Programmed Project.

Project Approval Phase

Studies of the identified alternatives are performed to determine the preferred alternative. The highest-level deliverables completed during this phase are the Final Project Report / Final Environmental Document.

Plans Specifications & Estimate (PS&E) Phase

Design details, quantity calculations, right of way requirements and contract specifications are developed and right of way and permits are secured for the chosen alternative. The highest-level deliverable completed during this phase is the PS&E Package.

Project Construction Phase

Construction contract administration and other activities to construct the project are performed. The highest-level deliverable completed during this phase is the constructed physical improvement.

Project Wrap Up Phase

All remaining project activities are completed. Products produced during this phase include Final Estimate, As-Built plans and the project history file.

2.2 PROJECT MANAGEMENT

Project management is the application of knowledge, skills, tools and techniques to project activities in order to meet (or exceed) sponsors' and external customers' needs and expectations from a project. Project management involves the interaction of three elements: people, processes and tools as indicated in Figure 2-2.

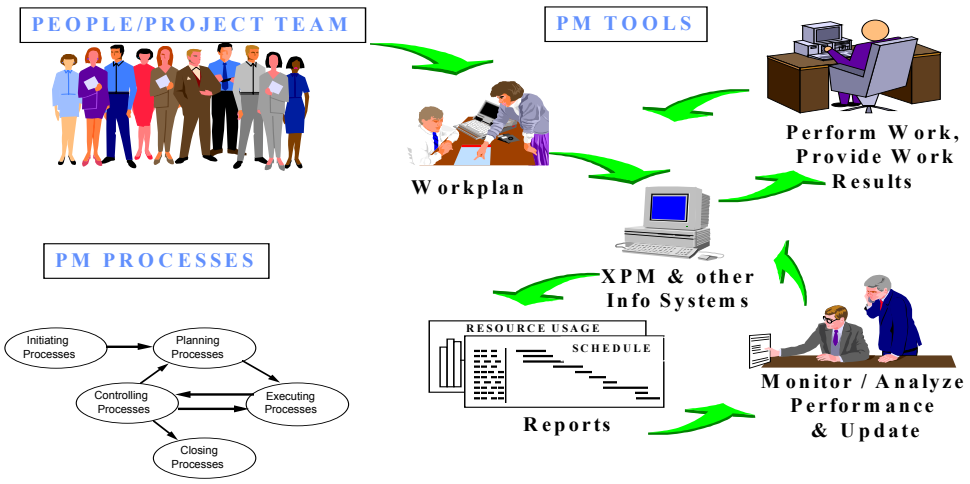

Figure 2-2 The Elements of Project Management

People/Project Team - People perform the work and determine the success or failure of a project. Chapter 3 discusses the organizational structure and responsibilities of the project team and other stakeholders involved in project management.

Project Management Processes - Processes specify products or deliverables required for the project and identify who will perform the work and when. They answer the question: "Who does what, when?". Chapter 4 discusses project management processes.

Project Management Tools - Tools and techniques are used by the project team and others to manage the project. Chapter 5 discusses project management tools.

2.3 PROGRAM MANAGEMENT

A program is a group of related projects managed in a coordinated way to obtain benefits not available from managing them individually.[2]

Program management is the simultaneous integration, management and control of multiple and diverse projects and differs from project management as shown in the table[3] below.

Project Management is:	**Program Management is:**
• The direction and supervision of a project	• The integration, coordination, communication and simultaneous control of multiple projects.
• A discipline	• An operating environment
• Project-wide (a tactical issue)	• Enterprise wide (a strategic issue)

CHAPTER 3 PEOPLE/PROJECT TEAM

3.1 PROJECT CUSTOMER/STAKEHOLDER

Project stakeholders are individuals and organizations who are actively involved in the project, or whose interest may be positively or negatively affected as a result of project execution or successful project completion.[4] A stakeholder is anyone who has a vested interest in the project.[5]

Stakeholder identification is difficult, but necessary. Naming or grouping stakeholders is primarily an aid to identifying which individuals and organizations can facilitate or hinder the delivery of a project.

Stakeholders on any Caltrans Capital Project can be grouped into one of the following:

External Project Customers – are transportation system users who pay for projects through fuel taxes, vehicle fees, tolls, bonds, sales taxes, fares and other charges.

Internal Project Customers – are individuals who will use the deliverables or information produced at various stages of the project. They are internal to the project, not necessarily to Caltrans (see "External Project Customers" and "Project Team").

Project Sponsors – are individuals or groups that represent external project customers by advocating a project or group of projects. Project sponsors may be internal or external to Caltrans.

- District Division Chiefs for Transportation Planning are the internal sponsors of interregional improvement projects.
- District Division Chiefs for Maintenance and Operations are the internal sponsors of SHOPP projects.
- Regional Transportation Planning Agencies, County Transportation Commissions, Cities and Counties are the external sponsors of regional projects.
- Sponsoring Local Entities are the external sponsors of locally funded projects (Sales Tax Authorities, Counties, Cities, etc.)

Other Stakeholders – These are individuals or organizations that can facilitate or hinder the delivery of a project. Included in this group are permitting agencies, other governmental agencies, environmental groups and unions.

Managing stakeholder needs and expectations is difficult because stakeholders often have very different objectives that may conflict. Finding appropriate resolutions to such differences can be one of the major challenges of project management. The project team must identify the stakeholders on a project, determine what their needs and expectations are, and then manage and influence those expectations to ensure a successful project. In general, differences between or among stakeholders should be resolved in favor of the customer.[6] Understanding the customer is key to determining the true requirements of a project.[7]

3.2 PROJECT TEAMS

Caltrans uses an interdisciplinary team approach to deliver transportation improvements that meet stakeholder needs. The project team initiates, plans, executes, controls and closes the various phases of the project life cycle to ensure successful delivery of a project. Successful project delivery hinges on effectively meeting stakeholder needs or communicating why their needs can not be met.

There is a project team on every project. Depending on the complexity of the project, project teams may be formally or informally organized. Individual team members may be active or inactive as a project progresses through the project life cycle.

Project Team Definition

The Project Team includes every person who works on a project. This includes State employees, consultants, contractors, utility companies, resource agencies and property owners. Each team member is an internal customer for some deliverables and a supplier of other deliverables.

Project Development Team

On large or complex Capital Projects Caltrans will use a formalized Project Development Team (PDT) approach in addition to the project team as defined in the Project Development Procedures Manual and illustrated in Figure 3-1. These projects will usually require or involve one or more of the following:

- significant new right of way
- a route adoption by the CTC
- work on access controlled facilities requiring a new or revised Freeway Agreement
- significant increase in capacity

A PDT is created to solicit formal project stakeholder input into the planning, development and evaluation of the various project alternatives during the early phases of a project. A PDT is an interdisciplinary team composed of key members of the project team as well as external stakeholders. A PDT approach can elicit stakeholder consensus on solutions to transportation problems where a project team, in and by itself, could not. This is primarily due to the fact that on a PDT, external stakeholders are given an active role in solving their problems. An informal approach to obtain stakeholder input is used by project teams for smaller projects that do not include the criteria listed above.

The PDT acts as a steering committee to advise and assist the project manager in directing the course of studies and the accumulation of data up through project approval. The PDT makes recommendations to district management and oversees the execution of the early phases of the project activities, culminating in "project approval". Following project approval, the PDT typically becomes inactive, however the PDT can be reconvened, as needed, to address significant project issues which may arise during any phase of the project life cycle.

Project Development Team Definition

A Project Development Team (PDT) is an interdisciplinary team composed of key members of the project team and external stakeholders who act as a steering committee in directing the course of studies required to evaluate the various project alternatives during the early phases of the project life cycle.

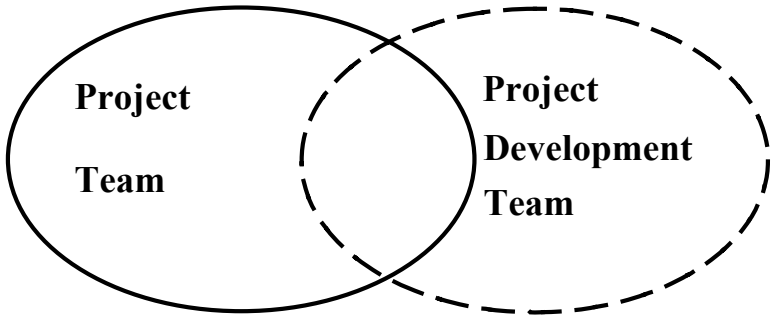

Figure 3-1 Project Team/Project Development Team

3.3 ORGANIZING FOR PROJECTS

Organizational Structure and Project Management

The structure of the organization affects the way resources become available to a project. The major approaches used by project based organizations to fulfill project commitments include the following organizational structures:

- Functional
- Projectized
- Weak matrix
- Strong Matrix

Each of these structures grants differing levels of formal authority to the project manager. The project manager in the functional organizational structure usually has little formal authority and has increased authority in the weak matrix and even greater authority in the strong matrix and projectized organizations.

Caltrans' functional organization of the past is changing to a predominately strong matrix organization, or one in which project managers must obtain products and services from a number of different units that range across the formal functional structure and are not under the project manager's direct supervision.

In the strong matrix organizational format the project manager is responsible for what, when, and how much it will cost while the functional manager determines how and by whom the task will be done.

The advantages of a strong matrix organization include:

- Highly visible project objectives.
- Maximum utilization of scarce resources.
- Increased project manager authority.
- Improved coordination across functional lines.
- Effective horizontal and vertical dissemination of information.
- Strong technical base is easier to develop and have available to all projects.
- Excellent training environment for prospective project managers.

To make a strong matrix work Caltrans must define:

- project roles and responsibilities
- project management processes

Although Caltrans is moving toward a strong matrix organization and a project manager with a high level of project authority, other organizational types exist. Smaller projects and projects with the majority of the work in one functional area will be assigned two-hat project managers, resembling a weak matrix organization.

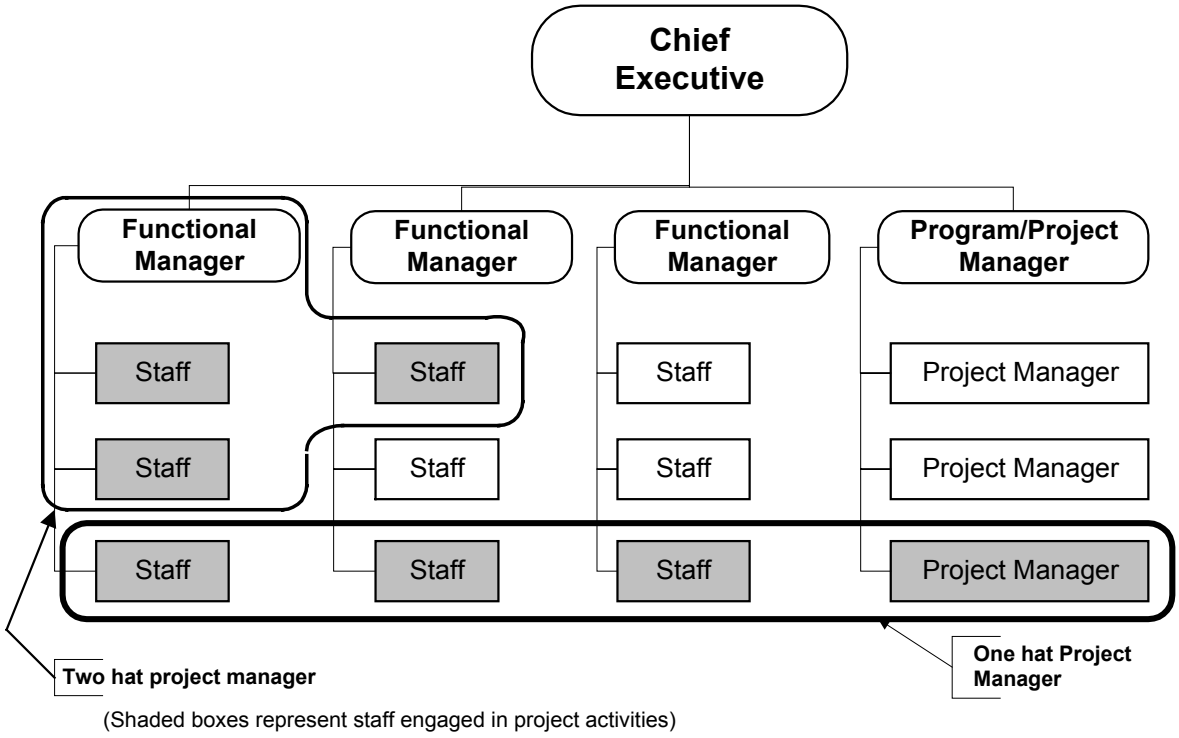

Figure 3-2 Matrix Organization

Figure 3-2 shows how the strong matrix (one hat project manager) overlays the formal functional organization. The weak matrix overlay is represented by the two hat project manager. Caltrans uses two types of project managers.[8]

One hat project managers are those whose duties consist solely of project management and do not include supervision. One hat project managers are generally assigned to all major Capital Projects including the following:

1. STIP, SHOPP, TSM, Seismic, Locally Funded and Toll projects.
2. Projects with multiple functional unit involvement and coordination.
3. Projects with a significant amount of local or private entity involvement.

Current Caltrans policy guidelines require that most project managers be one hat.

Two hat project managers are those whose duties consist of both project management and supervison of a functional unit. Two hat project managers may be used for:

1. Projects where a single functional unit can deliver 80 to 90 percent of the project.
2. Smaller projects such as Minor B and highway maintenance type projects.
3. Smaller specialty projects such as landscaping only or traffic signal projects.

3.4 RESPONSIBILITY, AUTHORITY AND ACCOUNTABILITY

Responsibility

Responsibility is the ethical commitment to accomplish the work with the quality promised in a timely and cost effective manner.

Specific responsibilities are discussed in the following pages.

Authority

Authority is the power (formal authority) granted to individuals so they can make decisions that others are expected to follow.[9] It is also acquired through knowledge, skills, abilities, and personal effectiveness (informal or earned authority).

The project manager has formal authority derived from his or her organizational assignment of being responsible for project delivery. Project managers can also acquire informal or earned authority on the basis of their knowledge and reputation, which includes the ability to influence others and solve problems. It is important to note that no project manager whose project activities cut across functional lines in a matrix organization can have complete authority.

The functional manager has authority derived from his or her supervisory position in the organization. Functional managers can also acquire informal or earned authority on the basis of their knowledge and reputation, which includes the ability to influence others and solve problems.

Accountability

Accountability is being answerable for meeting or for failing to meet a commitment.

3.5 EMPOWERMENT

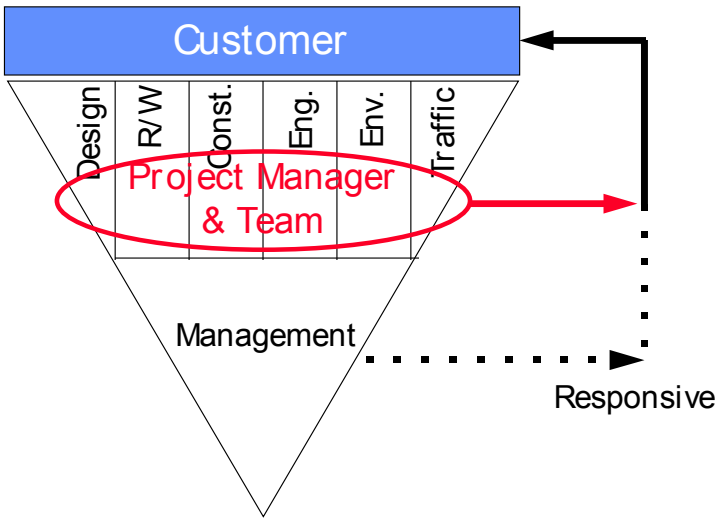

Figure 3-3 Empowerment

The high complexity associated with today's projects, combined with the customer's demand for responsiveness, requires management to empower the project team to meet customer needs as illustrated in Figure 3-3. Empowerment does not mean that managers abdicate their leadership role. It simply means that managers need to define the boundaries for, or delegate the level of authority to, each project team member that is commensurate with the individual's capability. Project team members are then free to carry out their assignments using their own judgment, skills, and methods; make unilateral decisions affecting how they do work; and accept responsibility for the outcome of their efforts.

3.6 PROJECT MANAGEMENT RESPONSIBILITIES

Project Sponsors

Project Sponsors:

- Identify and prioritize projects.
- Serve as advocates for their projects. This includes advocating for funding from the various funding programs (STIP, SHOPP, Minor, CMAQ, Toll, Sales Tax, etc.)
- Arrange funding for projects. For external sponsors, this includes working with the California Transportation Commission to arrange funding for STIP projects.
- Establish performance measures for measuring the quality of capital improvements.

District Division Chiefs for Program/Project Management

District Division Chiefs for Program/Project Management have overall responsibility for the management of the capital program in their districts or regions. They direct the Project Managers and the project management support unit.

Project Manager

The Project Manager has full authority, delegated from the District Division Chief for Program/Project Management, to produce the results that were intended, meet schedules, stay within budget and keep the sponsors and customers satisfied.[10] The Project Manager retains these responsibilities over the entire life of the project, and is the primary point of contact for the project sponsor. The Project Manager:

Initiates.

- Identifies the needs and expectations of the project sponsors.

Plans.

- Leads the project team in the development of a management plan that defines the project scope, schedule, cost, resource needs, risk and communication needs.
- Ensures that the project management plan includes all the work required, and only the work required to produce the product.

Controls.

- Monitors project performance and takes corrective action if necessary.
- Communicates sensitive issues and project progress to district management, the sponsors and the project team.
- Provides input into the performance evaluation of project team members and recommends changes to the project team membership when necessary.
- Is the single point of contact for the project on matters involving overall project scope, cost or schedule.
- Resolves problems that affect project scope, cost or schedule.
- Controls change to the project scope, cost or schedule throughout the project life-cycle, including construction.
- Manages the interface between task managers, ensuring that they know who will receive and use their products.
- Coordinates the efforts of the overall team, including chairing project team meetings.
- Controls the project budget (both support and capital).

Closes.

- Is responsible for timely project completion.
- Is responsible for ensuring that the final product meets the needs of the project customers.
- Discusses final product with sponsors to gauge their level of satisfaction.
- Prepares a final report on the project, with recommendations for improvement.
- Provides feedback to the team on lessons learned.

Functional Manager

Functional Managers are responsible for ensuring that the assigned staff have the necessary skills and that *products* comply with all applicable standards, regulations and policies. Functional Managers are involved in only a portion of the project lifecycle. They ensure that *intermediate products* meet the needs of internal customers. Project team members produce intermediate products for use by other team members. Intermediate products include reports, environmental documents, plans, specifications, estimates, appraisal reports, title deeds, permits, bid documents, as-built plans, etc. Functional Managers:

Plan.

- Assign project team members when requested by the Project Manager or task manager.
- Assign an equitable workload to individual employees.

Execute.

- Direct project team members in the delivery of products within the timeframe agreed in the project management plan.
- Develop qualified staff.
- Empower staff to do their jobs with the minimum supervision that is consistent with the individual's capability.
- Provide technical and procedural direction to staff performing the work.
- Approve staff and other project expenditures.

Control.

- Monitor and provide feedback to staff working on particular work packages.

Close.

- Ensure that *products* have the required features.

Task Manager

Task Managers are responsible for producing particular elements of the project Work Breakdown Structure. They are delegated the responsibilities of both the Project Manager and the functional manager for those elements. Task Managers are responsible to the Project Manager for producing work packages on time and within budget and to the Functional Manager for ensuring that work packages meet all applicable standards, regulations and policies. Task managers must know their internal project customers and ensure that their products meet those customers' needs.

If the WBS elements are produced entirely by one functional unit, the functional manager appoints the task manager. Functional managers may appoint themselves as task managers. If the WBS elements are shared among several functional units, the lowest level supervisor or manager who manages all those functional units appoints the task manager.

Task Managers:
Plan.

- Participate in the development of the project management plan.
- Commit to the scope, schedule and resource estimates of their portion of the project management plan.

Execute.

- Lead project team members in the delivery of products within the timeframe agreed in the project management plan.
- Provide activity status information to the Project Manager. ("Start date", "remaining duration", "finish date", "percent complete" and "hours at completion")
- Coordinate with other functional areas on planned work packages.
- Communicate sensitive project problems, issues, conflicts, or changes to the Project Manager and the functional manager.
- Resolve technical problems, issues, or conflicts raised by staff that do not compromise the overall project scope, cost and schedule, and that do not compromise product quality.
- Provide feedback to staff, functional managers and the Project Manager on lessons learned.
- Provide early identification to the Project Manager of issues that might impact the budgeted and scheduled delivery.

Functional Coordinators

Functional Coordinators coordinate the work of several functional units, and may be the task manager for all work packages produced by those units.

Within the Division or Service Center, the functional coordinator:
Controls.

- Monitors project performance and cost and takes corrective action if necessary.
- Provides input into the performance evaluation of project team members and recommend changes to the project team membership when necessary.
- Coordinates the efforts of the members of the project team.
- Assists the Project Manager to resolve problems that affect project scope, cost or schedule.

Closes.

- Provides feedback to the Project Manager on lessons learned.

Project Team

Project Team members are responsible for delivering timely and cost effective products with the quality promised. They:

Plan.

- Provide input into the development of the project management plan.

Execute.

- Deliver products within the timeframe agreed in the project management plan.
- Work together in a team environment.
- Monitor work package production and progress.

Control.

- Communicate sensitive issues and project progress to task managers.
- Control change to activities and products.

Close.

- Provide feedback to functional managers on how work can be done more effectively and efficiently.

3.7 OVERLAPPING RESPONSIBILITIES

On many projects there may be overlapping responsibilities. It is critical to the success of the project that agreement is reached on who will assume what responsibilities prior to the initiation of the project or a particular project phase.

CHAPTER 4 PROJECT MANAGEMENT PROCESSES

4.1 PROJECT MANAGEMENT PROCESSES[11]

Project Management Processes are concerned with describing and organizing the work of a project. They consist of five interconnected process groups, Initiate, Plan, Execute, Control and Close-out as illustrated in Figure 4-1.

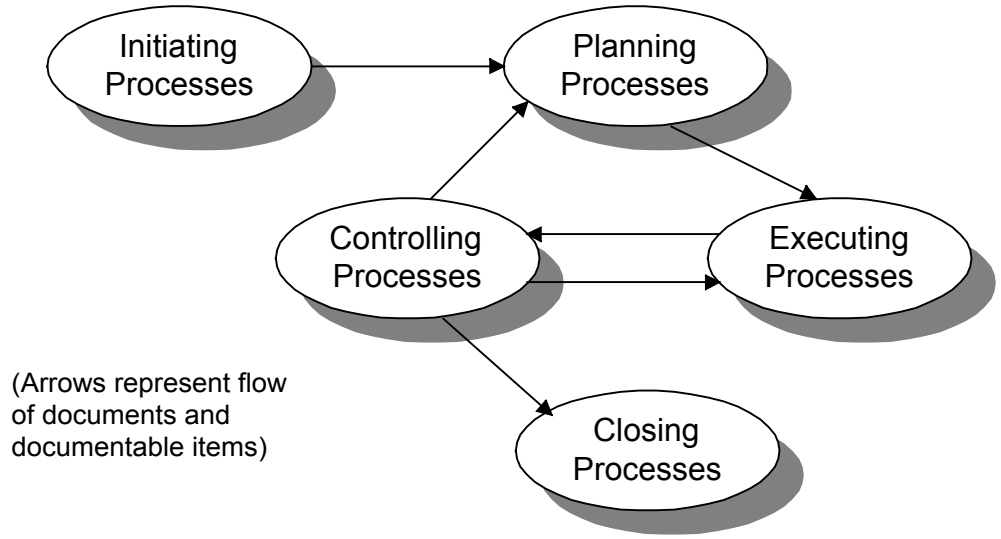

Figure 4-1 Project Management Processes

These process groups are defined as:

Initiating Processes - recognizing that a project or phase should begin and commit to do so. The assignment of a project manager is an initiating process for both the start of a project and PID Phase of the project life cycle.

Planning Processes - devising and maintaining a workable scheme to accomplish the business need that the project was undertaken to address. Workplan development and maintenance is a planning process that occurs in each phase of the project life cycle.

Executing Processes - coordinating people and other resources to carry out the project plan. Reporting staff work hours by work breakdown activity is an executing process that occurs in each phase of the project life cycle.

Controlling Processes - monitoring and measuring progress to ensure project objectives are being met and taking corrective actions when necessary. The Project Change Request process is a controlling process that can occur at various phases of the project life cycle.

Closing Processes - formal conclusion of the project or phase, bringing it to an orderly end. The closing of an EA is a closing process occurring at the end of a project or phase of the project life cycle.

Project management processes are linked by the results they produce--the outcome of one usually becomes an input of another. These groups are not discrete, one time events. They are overlapping activities that occur at varying levels of intensity throughout each phase of the project. Finally process group interactions also cross project life cycle phases such that the closing of one phase provides input to initiating the next phase as illustrated in Figure 4-2.

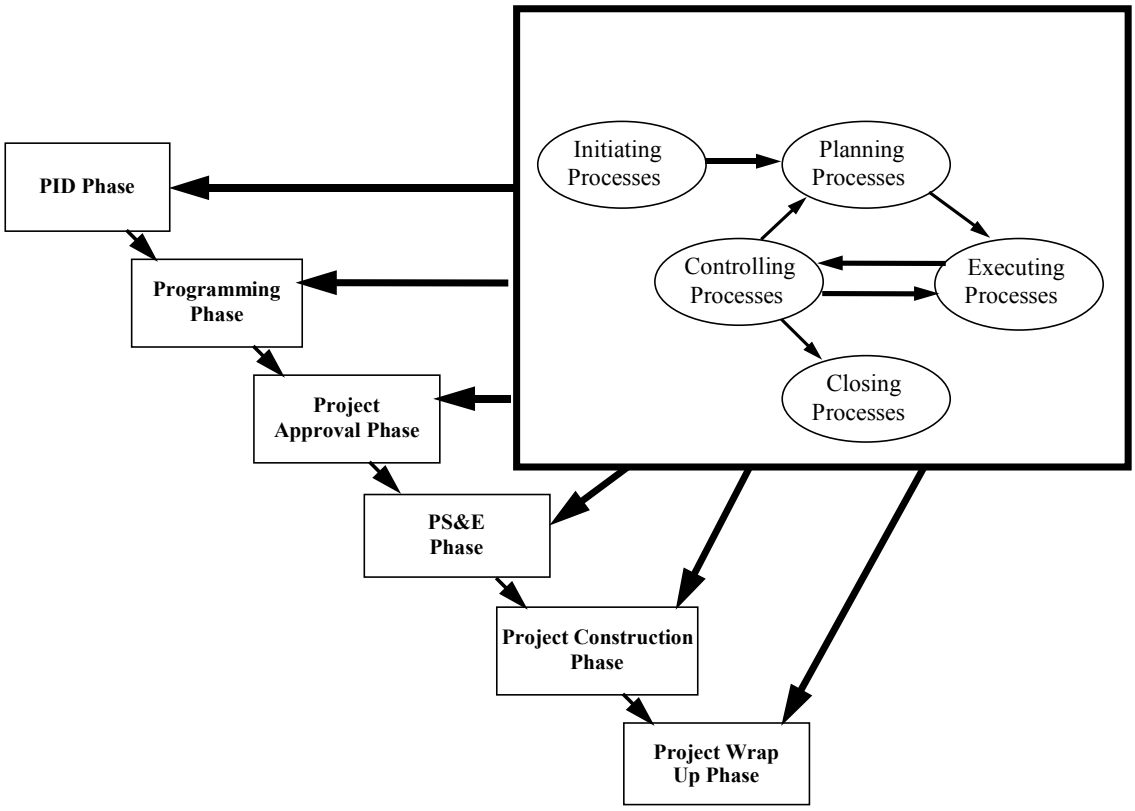

Figure 4-2 Project Life Cycle & PM Processes

4.2 PROJECT MANAGEMENT PROCESS COMPONENTS

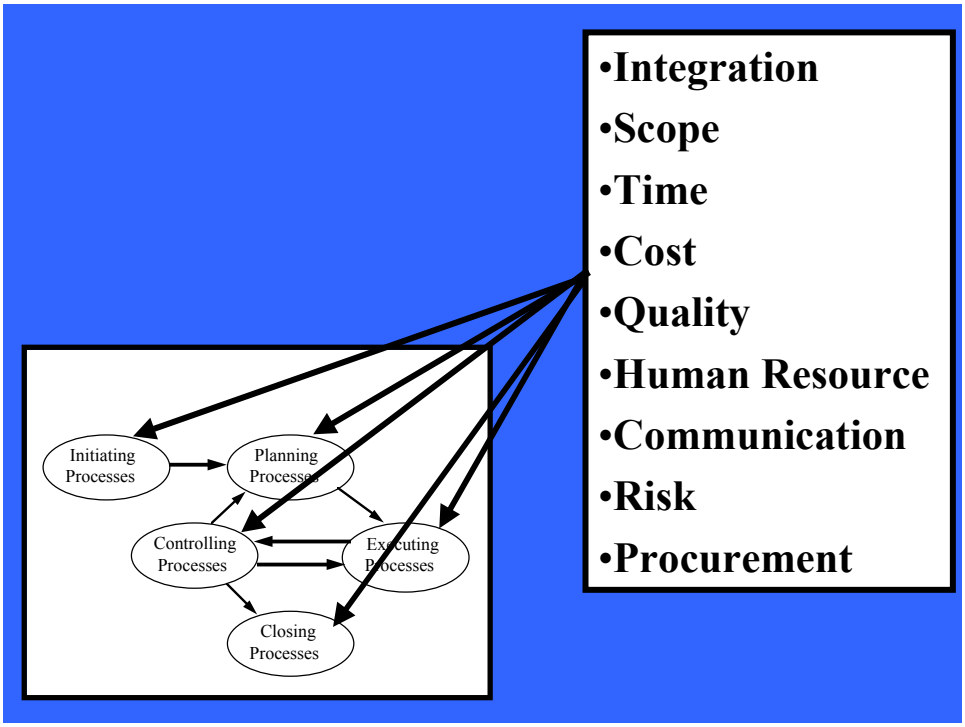

Figure 4-3 PM Processes and PM Components

Project management processes can be subdivided into one or more of the nine project management components as illustrated in Figure 4-3. These components describe project management processes in terms of project management knowledge areas.[12] Understanding and applying these knowledge areas to a project is crucial to successful project delivery. They include:

1. **Project Integration Management** - The application of the processes required to ensure that the various elements of the project are properly coordinated. To achieve this, Caltrans needs:
   a. To track the history of project scope, cost, and schedule from inception to completion.
   b. Multi-year project workplans and work agreements to guide the execution and control of project work and resources.
   c. Methods appropriate to the type of job (level of project management detail commensurate with complexity of project, i.e., major vs. minor projects).
   d. To form the project team early in the project life cycle. Individual members' level of involvement will vary as appropriate with the current phase of the work.
   e. To define how to share responsibilities among project team members to define and carry out project objectives.
   f. To balance scope, cost, and schedule with a focus on customer needs (quality).
   g. To follow documented project management policies and procedures that define department-wide standards.
   h. To provide flexibility in processes to recognize district or project specific uniqueness.

2. **Project Scope Management** - The application of the processes required to ensure that the project includes all the work required, and only the work required to complete the project. To achieve this, Caltrans needs to:
   a. Initiate projects that address documented transportation needs.
   b. Involve functional units in all facets of project scoping and planning.
   c. Involve customers and other stakeholders in defining and controlling project scope, and throughout project life-cycle to verify scope (customer acceptance during close-out).
   d. Promote team involvement to foster early recognition of alternative approaches (i.e., design vs. right-of-way trade-off).
3. **Project Time Management** - The application of the processes required to ensure timely completion of the project. To achieve this, Caltrans needs:
   a. To supplement the current "ready to list" goal with "construction completion" as the primary schedule delivery measurement goal.
   b. The ability to track progress and percentage of completion (project activities, percent of milestone complete).
   c. Methods to define typical project activities, sequence, and durations.
4. **Project Cost Management** - The application of the processes required to ensure the project is completed within the approved budget. To achieve this, Caltrans needs:
   a. Methods to establish typical support resource needs.
   b. The ability to establish project budgets (support and capital).
   c. To provide project managers with the ability to control support resources.
   d. The ability to estimate and track project-direct operating expenses.
   e. The ability to track planned vs. actual expenditures (including consultant and non-labor costs).
   f. The ability to relate projects to their funding authorization and expenditure authorization (EA).
5. **Project Quality Management** - The application of the processes required to ensure that the project will satisfy the needs for which it was undertaken. To achieve this, Caltrans needs:
   a. Quality standards, established by the project team, as appropriate, for specific project characteristics.
   b. To obtain stakeholder input early in order to develop project strategy.
   c. Measurement systems to gauge customer satisfaction.
   d. To obtain customer acceptance (internal and external) at delivery (defined as "construction completion").
   e. To focus on "lessons learned" for continuous project process and product delivery improvements.
6. **Project Human Resource Management** - The application of the processes required to make the most effective use of the people involved with the project. To achieve this, Caltrans needs:
   a. Well-defined organization structure, roles, responsibilities, accountability, and authority.
   b. To establish project manager core competencies.
   c. To define project manager workloads.
   d. The ability of Functional Managers to track assignment of resources (people) to tasks.
   e. To define processes and implement tools to balance functional workload.
   f. To provide the ability to Functional Managers to obtain flexible resources.

7. **Project Communications Management** - The application of the processes required to ensure timely and appropriate generation, collection, dissemination, storage, and ultimate disposition of project information. To achieve this, Caltrans needs:
   a. To develop communication plans to inform project stakeholders.
   b. Sufficient information to make decisions (i.e., project level costs and schedule, status, earned value, history of changes, etc.).
   c. To utilize new technology (Intranet/Internet, e-mail, etc.) to facilitate project communication.
8. **Project Risk Management** - The application of the processes concerned with identifying, analyzing, and responding to project risk. To achieve this, Caltrans needs:
   a. Proactive methods to identify potential project risks.
   b. Methods to develop response plan to identified risks.
   c. Methods to evaluate the uncertainties of project costs and schedule.
9. **Project Procurement Management** - The application of the processes required to acquire goods and services from outside the performing organization. To achieve this, Caltrans needs:
   a. Methods for project managers and functional managers to obtain flexible resources when Caltrans resources are unavailable.
   b. Methods to effectively obtain construction contractors.
   c. Methods to effectively procure and clear required real estate and obtain utility relocation.
   d. Methods to obtain other goods and services, including equipment and material.

CHAPTER 5 TOOLS

5.1 PROJECT MANAGEMENT PLAN

A Project Management Plan is a group of files used to guide project execution and control throughout the lifecycle of a project. It addresses the problem and need (why?), goals and objectives (what?), schedule (when?) and roles (who?). The project management plan includes, but is not limited to:

- The project charter.
- The workplan (resourced schedule).
- The quality management plan.
- The communication management plan.
- The risk management plan.
- The procurement management plan.

The single point of contact for the Project Management Plan is the project manager. The purpose for this is to ensure that the documents exist and are current; not to create an additional set of files and plans. The intent is to work within the existing file systems (Project Development Uniform File System).

5.2 PROJECT MANAGEMENT STANDARDS[13]

Project Management requires effective and precise exchange of information between all project team members. To provide for consistency of this information, the following three statewide standards are used together when developing and monitoring a workplan. For any task in the workplan there will be a Work Breakdown Structure (WBS) element with a Resource Breakdown Structure (RBS) element and an Organizational Breakdown Structure (OBS) element assigned.

Work Breakdown Structure (WBS)

The Work Breakdown Structure (WBS) is simply a formal and systematic way of defining and identifying the component parts of a project and the work to be done on them. It is a product oriented hierarchy that organizes and defines the total scope of Caltrans Capital Outlay Support (COS) work. This structure defines the work activities to produce products, not the staff or other resources who will complete the work.

Resource Breakdown Structure (RBS)

The Resource Breakdown Structure is a standardized list of personnel resources related by function and arranged in a hierarchical fashion. Each subsequent level of resources is a subset of the resource category above it. The RBS is used to assign resources to the scheduled WBS activities in the project schedule. The RBS corresponds to the standard Cost Center Coding structure so the actual expenditures can be associated with each scheduled activity for the purposes of cost collection and performance monitoring. The RBS is standardized statewide and allows "roll up" analysis based on functions such as Project Development, Engineering Services, Construction and Right of Way. In addition a consultant resource category has been established in each district RBS to segregate consultant resources from Caltrans resources in the workplans.

Organizational Breakdown Structure (OBS)

The final element of Caltrans project management standards is the Organizational Breakdown Structure that is a hierarchical description of the organization and is District and Service Center specific. It is used to identify responsible units or persons within the organization based on the district's organization chart. It allows the breakout of personnel into successively lower levels in the organization such as: district, division, office, branch, Section/Squad. The OBS allows resources to "roll up" (summarize) according to the organizational structure. This structure facilitates the identification of scheduled workload in workplans or project expenditures by organizational unit at the various levels.

Summary

The three management standards are used together when developing a workplan. For any task in the workplan you will have a WBS, RBS and OBS assigned:

- The WBS provides the standard description of the work to be performed and the expected deliverables.
- The RBS identifies the type (functional expertise) of resource assigned to perform the work.
- The OBS identifies organizationally who will be performing the work.

The same holds true for the expenditure history of the project. Review of expenditure records will provide information on what type of resources, how much of each (hours) was used and which organizational unit was involved in accomplishing each activity. This information then can be used to plan future projects.

5.3 PROJECT SCHEDULING TOOLS

Several project management scheduling tools have been used in Caltrans to assist in project schedule development and maintenance. These products automate the calculations of time and resource relationships and allow rapid analysis of many schedule alternatives. Historically, the Department has used the Person Year Project Scheduling and Cost Analysis system (PYPSCAN) exclusively to schedule and monitor projects. More recently, newer scheduling software tools have been introduced including Primavera, Microsoft Project and eXpert Project Management (XPM). Each of these systems use differing methodologies and have various features and performance characteristics. Currently XPM is the departmental tool to provide information for Capital Outlay Support budgeting and monitoring of project schedules.

5.4 INFORMATION SYSTEMS

Several information systems are available in Caltrans containing the information necessary to monitor and manage the important project factors including the following systems.

Project Management Control System (PMCS)

PMCS is a main frame computer project data base containing capital cost, scope and schedule data along with project characteristics (existing conditions, traffic and accident information, etc.) and projections for person year needs. PMCS provides an on-line viewing of all project data and most of the data can be entered on-line also. Preprogrammed batch reports can be run to provide multi-project information.

Transportation Accounting and Management System (TRAMS)

TRAMS is Caltrans' mainframe accounting database. Included in the information available is expenditure information by project. Preprogrammed or ad hoc reports are used to access the data.

Time Reporting System (TRS)

TRS is a mainframe system that allows on-line reporting of labor and leave data. Its purpose is to furnish timely, cost effective reporting of labor information. Time reporting is done on a weekly basis and therefore is available on a more timely basis than information from the monthly reporting cycle for TRAMS.

Project Management Data Warehouse (PMDW)

PMDW is a database containing general project information, project schedule, capital costs and operating expense data extracted and integrated from existing databases. The data is accessible to project delivery staff and managers for query purposes using desktop computer query tools.

5.5 COMMUNICATIONS

Frequent, understandable and concise communications are essential to successful progress toward completion of the project. A communications management plan for each project should be developed detailing:

- who will receive information (status reports, data, schedule, technical documentation, etc.),
- what methods (meetings, written reports, etc.,) will be used to distribute various types of information,
- a description of the information to be distributed (format, content, level of detail),
- a schedule for production and distribution,
- how the information will be updated, and
- how it can be accessed between scheduled communications.

The most common forms of communications include meetings, telephone and conference calls, formal letters and memos and fax transmittals. Newer forms of electronic communication include:

Electronic mail or E-Mail is a very fast, inexpensive and efficient way of distributing information and communicating. Electronic mail capabilities are available in all Districts, ESC and Corporate Headquarters making the statewide distribution information almost instantaneous.

Video conferences should be considered when a large number of widely dispersed persons need to interact or visual displays are needed. Video conferencing equipment is available in all Caltrans districts, ESC and Corporate Headquarters.

The Internet and Intranet can also be used to send electronic mail to organizations outside the Department and to access a wealth of information available including several of the Department's manuals, information from other federal, state and local governmental agencies, news articles on the project and on occasion a web site sponsored by a local interest group actively participating in the project (e.g., Route 1 - Devils slide).

CADD Files generated by CADD can be transmitted electronically to facilitate communication between districts and between the District and Corporate on various aspects of the project design.

In all cases, any significant communication should be documented and preserved in the project files.

CHAPTER 6 GLOSSARY OF TERMS

Baseline Workplan: The original workplan approved by the stakeholders**.**

Capital Project: A temporary endeavor undertaken to create a unique physical improvement to the transportation system in California. The word "project" refers to the work that is performed. Projects produce products.

Communications Management Plan: A plan detailing to whom information will flow, what methods will be used to distribute various types of information, a description of the information to be distributed, a schedule for production and distribution, how information will be updated, and how it can be accessed between scheduled communications.

Critical Path Method (CPM): A scheduling method which uses diagrams to graphically display the logical sequence of workplan activities. It is the method used to determine the length (time) of a project and to identify the activities that are critical to the completion of the project on time.

Current Workplan: The baseline workplan plus changes approved by the project manager and project team used to guide the day-to-day operations of project execution and project control. It is a reflection of reality that can be compared to the baseline workplan to assess progress and performance. It is dynamic and ever changing.

Customer: See External Project Customers and Internal Project Customers.

External Project Customers: are transportation system users who pay for projects through fuel taxes, vehicle fees, tolls, bonds, sales taxes, fares and other charges.

Federal Project: An authorization to incur federally reimbursable costs for a specific scope of work within specific geographic limits.

Functional Coordinators: are individuals appointed by a District Division Chief or Service Center Office Chief to coordinate the work of several functional units.

Functional Managers: are the immediate supervisors of the staff who work on the project.

Functional Unit: A group of people supervised by a functional manager.

Internal Project Customers: are individuals who will use the deliverables or information produced at various stages of the project. They are internal to the project, not necessarily to Caltrans (see "External Project Customers" and "Project Team").

Product-oriented Processes: are concerned with specifying and creating the project product, and are typically defined by the project life cycle.[14]

Product Scope: the features and functions that are to be included in a product. [15]

Program: A program is a group of related projects managed in a coordinated way to obtain benefits not available from managing them individually. The Capital Outlay Program can be decomposed into various elements that includes the STIP, SHOPP, TSM, etc.

Programmed Project: An entry in a programming document. It is a reservation of funds for a transportation improvement in a geographic location. The improvement and location are specified in the programming document.

Project: A temporary endeavor undertaken to produce a unique outcome.

Project Change Request: The process for obtaining approval for a project that has scope, cost and/or schedule changes (reference: Scope, Cost, Schedule Change Process memo dated May 15, 1992.)

Project Development Team: A Project Development Team (PDT) is an interdisciplinary team composed of key members of the project team and external stakeholders who act as a steering committee in directing the course of studies required to evaluate the various project alternatives during the early phases of the project life cycle.

Project Initiation Document (PID): Concept approval document for candidate projects (i.e. Project Study Report, Project Scope Summary Report, Noise Barrier Scope Summary Reports and others.)

Project Life Cycle: The phases through which a project passes. A phase is marked by the completion of a highest-level deliverable in the project Work Breakdown Structure.

Project Management: The application of knowledge, skills, tools, and techniques to project activities in order to meet (or exceed) sponsors' and external customers' needs and expectations from a project.

Project Manager: The individual responsible for managing a project.

Project Scope: the work that must be done in order to deliver a product with the specified features and functions.[16]

Project Sponsors: are individuals or groups that represent external project customers by advocating a project or group of projects. Project sponsors may be internal or external to Caltrans.

Project Team: Every person who works on a project. This includes State employees, consultants, contractors, utility companies, resource agencies and property owners. Each team member is an internal customer for some deliverables and a supplier of other deliverables.

Quality Improvement Project: A temporary endeavor undertaken to improve the way in which capital projects meet customer needs. They include process improvements, training, and tools.

Right of Way Only Project: an entry in the STIP or SHOPP that has funds programmed only for right of way.

Scope Document: See Project Initiation Document (PID).

Single Focal Point (SFP): The District Division Chief for Program / Project Management.

Stakeholder: Individuals or organizations who are actively involved in the project or whose interests may be positively or negatively affected as a result of project execution or successful project completion.

Task Managers: are individuals who are delegated the responsibilities of both the Project Manager and the functional manager for the production of particular elements of the project Work Breakdown Structure.

Workplan: Resourced schedule.

CHAPTER 7 ACRONYMS

CADD	Computer-aided Design and Drafting
COS	Capital Outlay Support
CTC	California Transportation Commission
EA	Expenditure Authorization
ESC	Engineering Service Center
OBS	Organizational Breakdown Structure
PCR	Project Change Request
PDT	Project Development Team
PID	Project Initiation Document
PM	Project Manager or Project Management
PMCS	Project Management Control System
PMDW	Project Management Data Warehouse
PS&E	Plans, Specifications & Estimate
PYPSCAN	Person Year and Project Scheduling and Cost Analysis
RBS	Resource Breakdown Structure
SFP	Single Focal Point
SHOPP	State Highway Operation & Protection Program
STIP	State Transportation Improvement Program
TRAMS	Transportation Accounting and Management System
TRS	Time Reporting System
WBS	Work Breakdown Structure
XPM	eXpert Project Management

FOOTNOTES

[1] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, 1996, page 167, modified

[2] Ibid., page 8.

[3] Rudolph G. Boznak, *Management of Projects. PM Network*, January 1996.

[4] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, 1996, page 15.

[5] Lewis, James P., 1995, *Project Planning, Scheduling and Control*, Page 40, Chicago, Ill., Irwin Professional Publishing.

[6] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, 1996, page 17.

[7] Ireland, Lewis R., 1991, *Quality Management for Projects and Programs*, Page II-1., Upper Darby, Pa. Project Management Institute.

[8] Memorandum signed by James W. Van Loben Sels, dated November 20, 1996, *Policy Guidelines on Implementing One Hat Project Management* and attached *Statewide One Hat Project Management Implementation*.

[9] Lewis, James P.,1995, *Project Planning, Scheduling and Control*, Page 44. Chicago, Ill., Irwin Professional Publishing

[10] Linn C. Stuckenbruck, *The Implementation of Project Management*, Project Management Institute, 1995, page 28

[11] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, 1996, page 15., page 28

[12] Ibid., pages 37 - 133

[13] Additional detail on these management standards can be found in the *Guide to Caltrans Capital Outlay Support Work Breakdown Structure*, dated May 1996, and the *Briefing Package on Capital Outlay Support Work Breakdown Structure (WBS)*, *Resource Breakdown Structure*, dated June 1995.

[14] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, 1996, page 27.

[15] Ibid., page 47

[16] Ibid., page 47